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(54) Growing medium comprising a zeolite

(57) A plant growth medium comprises a zeolite, preferably incorporated in a plant physiologically acceptable carrier medium such as a solid or an aqueous carrier.

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SPECIFICATION

Growing medium

The present invention relates to a growing medium, notably a solid or aqueous horticultural growing medium.

Peat, bark, shredded paper, perlite, vermiculite and similar substrates have been widely used as the basis for horticultural growing media. These substrates have been mixed with sources of plant nutrients, pH controlling materials and other ingredients which aid or protect the growth of plants to provide media for use in flower beds, tubs, pots or bags in which plants, bulbs, seeds or cuttings are planted and grown on.

Plantgrowing media made from such substrates suffer from the problems that nutrient materials such as ammonium, potassium, magnesium, iron, manganese, copper and other salts are leached out of the medium and are lost before the nutrient values thereof are used by the plant; that ammonia is often evolved in poorly drained growth media causing root scorch; and that soluble salts tend to build up to unacceptably high levels in a ny free moisture which may collect in the growth medium.

Surprisingly, we have found that these problems can be reduced if the growth medium comprises a zeolite mineral, for example clinoptilolite.

The present invention therefore provides a plant growth medium which comprises a zeolite, preferably incorporated in a plant physiologically acceptable carrier medium such as a solid or an aqueous carrier.

The invention also provides a method for raising plants which comprises growing the plant in a growth medium which comprises a zeolite.

The zeolites for present use may be natural or synthetic. Suitable natural zeolites include analcine, chabazite, clinoptilolite, heulandite, natrolite, stilbite, thorisonite and the like. Suitable synthetic zeolites include the synthetic equivalents to the above named natural zeolites formed by reacting a silica component (notably silica gel, silicic acid or sodium silicate) with an alumina component (notably aluminium trihydrate, alumina or sodium aluminate). Preferred methods and components are those described in US Patent No. 2882243.

The zeolite preferably has a particle size selected to suit the desired rate of release of the active component of the zeolite. Typically, the zeolite will have a particle size of 4mm or less, eg. 2 to 4 mm for some uses or 1 mm and less fr other uses. The desired particle size can be achieved by any suitable technique, eg. wet or dry milling.

The zeolite can be present in the growing medium in a wide range of proportions, eg. as little as 1% by weight. However, it is preferred to use between 5 and 30% by weight. Higher proportions can be used if desired and it is within the scope of the present invention for the growing medium to consist essentially wholly of the zeolite.

The growing medium of the invention comprises a carrier for the zeolite. As indicated above, the carrier can be provided by the zeolite itself or by an aqueous medium, eg. an aqueous nutrient solution as used in a nutrient film or hydroponic plant growth technique. However, it is preferred that the carrier be a plant acceptable solid carrier material. The solid carrier can be selected from any of the commonly used substrates, including peat, bark, shredded paper, sand, soil, perlite or vermiculite.

The compositions for present use can contain other materials commonly used in plant growth media, for example fertilisers, pH-controlling materials, biocidal materials, trace element salts and other plant physiologically acceptable materials.

The fertiliser for present use typically comprises one or more plant nutrients such as nitrogen, phosphorus, potassium, calcium, magnesium etc. Suitable nitrogen-containing materials include ammonium nitrate, ammonium sulphate, ammonium phosphate, urea calcium nitrate, potassium nitrate, calcium cyanamide, calcium ammonium nitrate and ammonium sulphate nitrate. Suitable potassium-containing materials include potassium chloride, potassium sulphate, potassium phosphates etc. Suitable phosphorus-containing materials include calcium phosphates, (single and triple superphosphate), rock phosphate, ammonium phosphates, potassium metaphosphate etc. Suitable magnesium-containing materials include magnesium ammonium phosphate, magnesium oxides and hydroxides, magnesium sulphates, magnesium carbonates and magnesium calcium carbonates.

Suitable trace element sources sulphates, nitrates and chlorides or iron, magnesium, manganese, copper, cobalt, nickel, molybdenum and other necessary metals, together with oxy acid complexes of boron, molybdenum selenium, chelates or iron, manganese, copper, cobalt and nickel.

The fertilizer material for present use can also be provided in the form of waste solutions of metal ions, e.g. waste metal plating solutions, or as ore compounds or scrap metal dissolved in acidic solutions.

Suitable biocidal materials include fungicides, eg. azithiram, benquinox, capton, dazomet, dichlone, dinex, dinocap, dithianon, dodine, ethoxyquin, fentin hydroxide, griseofulvin, maneb, oxine copper, quintozene, thiram, zineb and ziram; insecticides, eg. aldrin, allethrin, BHC, butonate, chlorodane, cuprobam, DDT, dieldrin, DNOC, heptachlor, parathion, TEPP, and vamidothion; rodenticides,

eg. antu, coumachlor, pindone and warfarin; bactericides, eg. oxytetracycline and streptomycin; herbicides, eg. atrazine, chloroxuron, 4CPA, 2,4-D, dalapon, 2,4-DB dichlobenil, dichlorprop, diquat, fenoprop, MCPA, paraquat, simazine, 245-T, and dicamba; and nematocides, eg. dazomet, metham and thionazin.

The pH-controlling materials act as a buffer in the plant growth medium and may also have some fertiliser activity. Desirably the pH-controlling materials maintain the pH of the medium in the range 6 to 11. Such materials include carbonates, notably calcium carbonate, limestone, dolomite, etc.

If desired, the zeolite can be treated before being incorporated into the carrier medium to introduce nutrient ions thereinto. Thus, the zeolite can be charged with nutrient cations such as ammonium, potassium, magnesium, iron, manganese, copper and other trace elements. The charging is typically carried out by contacting a zeolite such as a sodium zeolite with an aqueous solution or suspension containing fertiliser salts such as ammonium, potassium etc. salts; and subsequently separating the ion exchanged zeolite and, if necessary, drying. The solution or slurry containing fertiliser salts may be waste water, sewage leachant, liquid waste from fish farms, intensive animal husbandry systems and poultry waste as well as solutions of synthetic nutrient salts.

The plant growth media of the invention can be made by any suitable technique, eg. by dry or wet mixing the zeolite with the other solid ingredients of the composition or by suspending or dispersing the solid zeolite in an aqueous nutrient solution.

The growth medium of the invention is used in the same manner as a conventional medium to grow seddlings, cuttings or plants therein. The media of the invention can be used to grow commerical scale crops including salad crops notably tomato, lettuce and cucumber; floral crops notably roses, carnations, freezias and chrysanthemums; bedding plants; hardy annuals; shrubs and most container-grown decorative horticultural species.

The following Example is given to illustrate the present invention.

A soaking pit is prepared by lining a pit or trench dug in the ground with polythene sheet to aid liquid retention. The pit is charged with the zeolite clinoptilolite having a particle size ranging from approximately 4 mm to dust particle size. The use of a range of particle sizes gives a broad range of uptake rates of fluid by the zeolite and varies the rate at which nutrients are subsequently released to plant by leaching from the treated zeolite.

Sewage sludge, liquid effluent from sewage and/or an aqueous solution of an ammonium fertilizer material is poured into the pit. Sufficient liquid is used to saturate the zeolite; and the mixture is allowed to stand for from 1 to 7 days.

At the end of this time the solid is recovered from the pit and excess fluid drained off. The resultant solid can be applied to the land directly, eg. into trenches in which cropss are to be grown; or can be incorporated into horticultural composts.

CLAIMS

1. A plant growth medium which comprises a zeolite incorporated in a plant physiologically acceptable carrier medium.

2. A plant growth medium as claimed in claim 1 wherein the carrier medium is a solid or a fluid aqueous carrier.

3. A plant growth medium as claimed in either of claims 1 or 2 wherein the zeolite is selected from analcine, chabazite, clinoptilolite, heulandite, natrolite, stilbite, thorisonite or synthetic equivalents thereof.

4. A plant growth medium as claimed in any of the preceding claims wherein the zeolite has a particle size of 4 mms or less.

5. A plant growth medium as claimed in any of the preceding claims wherein the zeolite is present in from 5 to 30% by weight of the growth medium.

6. A plant growth medium as claimed in any of the preceding claims wherein the zeolite has been given a pretreatment to introduce nutrient ions thereinto before it is incorporated into the plant growth medium.

7. A plant growth medium according to claim 1 substantially as hereinbefore described.
such as a solid or an aqueous carrier.

8. A method for preparing a plant growth medium as claimed in claim 1 wherein a zeolite is incorporated into a fluid or solid plant growth medium.

9. A method for raising plants which comprises growing the plant in a growth medium which comprises a zeolite.

10. A method as claimed in claim 9 wherein the medium is one as claimed in any one of claims 1 to 7

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